Neurolinguistics is the study of how a language is represented in the brain and the study of the relationship between language and the brain/mind, how and where our brain stores our knowledge of the language that we speak, understand, read and write, what happens in our brains as we acquire that knowledge, and what happens as we use it in our everyday life. It studies the biological and neural foundations of language, often based on data from atypical or impaired language. Neurolinguistics is closely related to psycholinguistics, specifically focused on the brain´s physiological reactions associated with language.

Psycholinguistics is the study of how humans acquire, interpret and use language, and the study of the language processing steps that are required for speaking and understanding words and sentences. The study includes both the psychological factors and the neurobiological factors involved. Psycholinguistics is a domain with fuzzy boundaries. (a broad view of the discipline might embrace all the following:

Language processing: including language skills like reading, writing, speaking and listening and the part played by memory skills.

Lexical storage and retrieval: how we store words in our mind and how we find them when we need them.

Language acquisition: how an infant acquires its first language.

Special circumstances: the effect upon language of deafness, blindness, dyslexia, etcetera.

The brain and language: where language is located in the brain, how it evolved and whether it is faculty that is unique to human beings.

Second language acquisition and use.

Speech perception is another focus in psycholinguistics and deals with how humans comprehend and process speech in real time. The **Trace model** is a theory of speech perception in which interactions between different processing units allow people to process speech as they hear it.

Neurobiology is a complex science that studies the brain and nervous systems of humans and other animals. It can study the development of the brain in the developing animal or the neurological origin of disease.

CHOMSKY (pioneer in psycholinguistics) argues that all normal humans have an innate language ability and that all humans' languages have a common underlying structure known as universal grammar.

Communication: Communicative signals and informative signals. Someone listening to you may become informed about you through a number of signals that you have not intentionally mentioned. When you use language, you are considered to be intentionally communicating something. Humans are capable of producing sounds and syllables in a stream of speech that appears to have no communicative purpose.

Hockett´s 16 Properties of Human Language

Humans are clearly able to reflect on language and its uses. This is **reflexivity**, accounts for the fact that we can use language to think and talk about language itself, making it one of the distinguishing features of human language. Humans can use language to talk about language.

Human language users are normally capable of producing messages and then going to say a whole sentence. Humans can refer to past and future time. This property is **displacement**, it allows us to talk about things and places whose existence we cannot even be sure of.

The linguistic form has no natural or "iconic" relationship with that four-legged barking object out in the world. This aspect of the relationship between words and objects is **arbitrariness**. It is possible to make words "fit" the concept they indicate. There is no intrinsic or logical connection between a sound form and its meaning. Spoken words are really nothing like the objects they represent.

We don't inherit our parent´s language. We acquire a language in a culture with others speakers and not from parental genes. This process through which a language is passed on from one generation to the next is **cultural transmission**. It´s clear that humans are born with some kind of ability to produce utterances in a specific language. We acquire our first language as children in a culture.

Humans create new expressions by manipulating their linguistic resources to describe new objects and situations. This property is **productivity** and means that the potential number of utterances in any language is infinite. The human is capable of creating a "new" signal, after initial surprise maybe, by saying something never said before.

Human language is organized at 2 levels simultaneously. This is **duality**. At one level we have distinct sound and at the other level, we have distinct meaning. This duality of levels is a feature of human language because with a limited set of sounds, we are capable of producing a very large number of sound combination that are distinct in meaning.

Vocal-auditory channel refers to the idea that speaking/hearing is the mode humans use for language, not taking into account sign language.

Broadcast transmission and directional reception is when humans speak, sound are transmitted in all directions, however, listeners perceive the direction from which the sounds are coming. This is characteristic of most forms of communication.

Transitoriness refers to the idea of temporary quality of language. Language sounds exist for only a brief period of time. Sounds waves quickly disappear once a speaker stops speaking.

Interchangeability refers to the idea that humans can give and receive identical linguistic signals; humans are not limited in the types of messages they can say or hear. A speaker can physically create any and all messages regardless of their truth or relation to the speaker. Anything that one can hear, one can also say.

Total feedback speakers of a language can hear their own speech and can control and modify what they are saying as they say it.

Specialization the purpose of linguistic signals is communication. When humans speak or sing, it´s generally intentional.

Semanticity specific sounds signals are directly tied to certain meanings.

Discreteness, a linguistic representation can be broken down into small discrete units which combine with each other in rule-governed ways. They are perceived categorically, not continuously. We cannot express smaller or larger quantities by varying how loudly we pronounce.

Prevarication is the ability to lie or deceive. Using language, humans can make false or meaning statements.

Learnability language is teachable and learnable. As a speaker learns their first language, the speaker is able to learn other languages. Language acquisition is constrained by a critical period such that it becomes more difficult once children pass a certain age.

Language and the brain. Features of language that people use to produce and understand linguistic messages.

The functional asymmetry of the human brain is unequivocal, and so its anatomical asymmetry.
Language and the brain are intimately connected. Specific areas of the brain are devoted to language. Normal brain development depends on early and regular exposure to language.

The Human Brain.

The brain is the most complex organ of the body. The surface of the brain is the **cortex** or "grey matter", consisting of neurons. It is the decision-making organ of the body. It receives messages from all of the sensory organs, initiates all voluntary and involuntary actions and storehouse of our memories. Somewhere in the grey matter resides the grammar that represents our knowledge of language.

The brain is composed of **cerebral hemispheres**, right and left, joined by the **corpus callosum**, a network of fibers. It allows the 2 hemispheres of the brain to communicate with each other. Without this system of connections, the 2 hemispheres would operate independently.

Language Areas in the Brain.

Broca´s Area.

Is technically described as the "anterior speech cortex" or Broca´s Area. Paul Broca, a surgeon, proposed that language is located to the front part of the left hemisphere. He reported that damage to this specific part f the brain was related to extreme difficulty in producing spoken language. Language ability must be located in the left hemisphere. Broca´s area is crucially involved in the generation of spoken language.

Wernicke´s Area.

Is the "posterior speech cortex" or Wernicke´s area. A German doctor reported that damage in this part cause speech comprehension difficulties. This area is closely to the part of the brain, the auditory cortex, that processes what we hear. Wernicke´s area is part of the brain crucially involved in the understanding of spoken language.

The Motor Cortex.

It generally controls movement of the muscles. The part of the Motor cortex that is close to Broca´s area controls the articulatory muscles of the face, jaw, tongue and larynx and hance the physical articulation of speech.

The Arcuate Fasciculus.

It is a bundle of nerve fibers and is known to form a crucial connection between Wernicke´s and Broca´s areas.

Localization view.
Localization of language in the brain.
The brain activity involved in hearing a word, understanding it then saying it, would follow a definite pattern. The word is heard and comprehended via Wernicke´s area. This signal is then transferred via the Arcuate Fasciculus to Broca´s area. A signal is then sent to part of the motor cortex to physically articulate the word.

Gall (a pioneer) proposed the theory of localization which is the idea that different human cognitive abilities and behaviours are located in specific parts of the brain. He proposed that language is located in the frontal lobes of the brain because as a young man he had noticed that the most articulate and intelligent of his fellow students had protruding eyes.

He also put forth a pseudoscientific theory known as phrenology, which is the practice of determining personality traits, intellectual capacities and other matters by examining the "bumps" on the skull.

Gull argues against the prevailing view that the brain was an unstructured organ.

<u>The tip of the tongue phenomenom.</u>

The Tip of the Tongue Phenomenom is when we feel that some word is just eluding us. We know the word, but it just won´t come to the surface. Studies have shown that speaker have an accurate phonological outline of the word, can get the initial sound correct and mostly know the number of syllables in the word. It occurs with uncommon words and names.

<u>Slips of the Tongue.</u>
This produce expressions such as "a long shory stort" instead of make a long story short. Slips of this type are called spoonerism.

<u>Slips of the Brain:</u> 3 general types.

Perseveration: Is when one sound is carried over the next word (my favourite song, my favourite fong)
Anticipation: Is when a sound is used before its occurrence in the next word (roman numeral, nomal numeral).

Exchange: Is when sounds change places (feel better, beel fetter).

They result from slips of the brain as it organizes and generate linguistic messages.

Aphasia.

Is defined as an impairment of language function due to localized brain damage that leads to difficulty in understanding and/or producing linguistic forms. It is also the neurological term for any language disorder that results from brain damage cause by disease or trauma. The most common cause is a stroke. That makes a reduction in the ability to use language.

Broca´s Aphasia.

This language disorder is characterized by a substantially reduced amount of speech, distorted articulation and slow, often effortful speech. In agrammatic speech, the grammatical markers are missing.

Wernicke´s Aphasia, Jargon Aphasia.

Is a language disorder that results in difficulties in auditory comprehension. Someone suffering this disorder can produce very fluent speech which is often difficult to understand.

Difficulty in finding the correct word, anomia, also happens in Wernicke´s aphasia.

Conduction Aphasia.

Another type of aphasia has been associated with damage to the Arcuate Fasciculus. Individuals sometimes mispronounce words, but don't have articulation problems. They are fluent, but may have disrupted rhythm because of pauses and hesitation. What the speaker hears and understands can´t be transferred very successfully to the speech production area.

Difficulties in speaking can also be accompanied by difficulties in writing.

Dichotic Listening.

This technique uses the generally established fact that anything experienced on the right-hand side of the body is processed in the left hemisphere, and anything on the left side is processed in the right hemisphere.